

# ANTIMONY

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Domestic primary smelter production increased moderately in 1996, but consumption of primary antimony declined slightly. The antimony price declined sharply during the year, ending at approximately the same price that prevailed before the precipitous price rise that occurred in 1994.

The estimated value of primary antimony metal and oxide produced in 1996 was \$100 million. The estimated distribution of primary antimony uses in the United States was as follows: flame-retardants, 62%; transportation, including batteries, 15%; chemicals, 10%; ceramics and glass, 8%; and other, 5%. (*See tables 2, 3, and 4.*)

A small amount of antimony was recovered as a byproduct of the smelting of domestic lead and silver-copper ores, but almost all primary antimony metal and oxide produced domestically originated from imports.

Primary antimony metal and oxide were produced by six companies operating six plants using domestic and foreign feed material. Two plants were in Texas, and one each in Idaho, Montana, Nebraska, and New Jersey. Most domestic antimony smelting consisted of upgrading imported antimony trioxide to a higher purity.

Nearly all domestic secondary antimony was recovered at secondary lead smelters from recycled lead-acid batteries. A review of U. S. Geological Survey (USGS) data showed that recovery of secondary antimony had been overstated in the 1994 and earlier Annual Reviews. Accordingly, the revised figures for secondary production in table 1 are markedly lower than shown heretofore. Recycling and domestic mine output supplied less than one-half of the estimated domestic demand for antimony.

Antimony was mined as a principal product and produced as a byproduct of the smelting of base metal ores in 17 countries. It was estimated that China alone accounted for more than three-fourths of world mine production. Bolivia, China, Russia, and South Africa together accounted for about 91% of world mine production. Identified world antimony reserves at yearend 1996 were estimated to be 4.2 million metric tons.

## Legislation and Government Programs

Sales of antimony from the National Defense Stockpile (NDS) proceeded for the fourth consecutive year. Sales were conducted on a negotiated bid basis and were held by the Defense Logistics Agency on the second Tuesday of each month. There was no maximum quantity that a company could bid on; however, there was a minimum of 4.5 metric tons (10,000 pounds) for each transaction. The material offered was Grade A and B ingots or cakes. Beginning in November 1996, broken pieces of Grade A material and antimony sulfide ore also

were offered. In calendar year 1996, a total of 4,299 tons was sold. At yearend 1996, the antimony inventory in the NDS was 23,190 tons. Antimony is stockpiled in Government warehouses at 13 locations, with the Somerville, NJ, depot holding the largest amount.

## Production

**Mine Production.**—In the Coeur d'Alene District of Idaho, Sunshine Mining Co., the sole domestic producer, recovered antimony as a byproduct of the treatment of complex silver-copper-antimony sulfide ore. The company responded to the USGS voluntary canvass request.

**Smelter Production.**—The domestic producers of primary antimony metal and oxide products were ASARCO Incorporated, Omaha, NE; Amspec Chemical Corp., Gloucester City, NJ; Anzon Inc., Laredo, TX; Laurel Industries Inc., La Porte, TX; Sunshine Mining Co., Kellogg, ID; and U.S. Antimony Corp., Thompson Falls, MT. All six primary smelters replied voluntarily to the USGS request for production data.

Old scrap, predominantly lead battery plates, was the source of almost all of the secondary antimony output. New scrap, mostly in the form of drosses and residues from various sources, supplied the remainder. Antimonial lead was the main market for scrap antimony.

## Consumption

Domestic consumption of primary antimony declined slightly in 1996. Antimonial lead registered the sharpest relative decline. Lead-antimony alloys were used in automotive vehicle batteries, ammunition, corrosion-resistant pumps and pipes, tank linings, roofing sheets, solder, cable sheaths, and antifriction bearings. Antimony compounds were used in plastics as stabilizers and as flame retardants. Antimony trioxide, often immersed in an organic solvent, was used to enhance the flame retardant properties of plastics, textiles, and other combustibles. Antimony was used as a decolorizing and refining agent in some forms of glass, such as optical glass.

Of the 177 companies to which a voluntary USGS canvass form was sent, 153 firms responded; consumption data for 24 firms were estimated.

## Prices

In 1996, antimony metal prices continued the downward drift that had started in 1995, declining from the peak price established in late 1994, climaxing the dramatic surge in prices that began in the spring of 1994. The major cause of the

1994-95 price increase may have been the extensive flooding in the major antimony mining regions in China, which caused interruptions in production and delays in shipping. Those disruptions eased by late 1995, and normalcy returned by 1996. Thus, prices drifted steadily downward in 1996 toward normal historical levels.

The New York dealers' antimony metal price, published by Platt's Metals Week, averaged \$1.47 per pound for the year, compared with \$2.28 per pound in 1995. The price range for high-tint antimony trioxide, published by American Metal Market, was \$2.30 to \$2.45 at the beginning of the year and finished the year at \$1.25 to \$1.30 per pound.

### **Foreign Trade**

Imports of antimony metal increased somewhat in 1996. China supplied about 74% of the antimony metal imports. Imports of antimony oxide also increased somewhat in 1996, with China supplying about 42% of the imports. (*See tables 5, 6, 7, and 8.*)

### **Outlook**

Domestic antimony demand declined slightly in 1996. The decline occurred in a year in which antimony prices declined sharply, and the softening of domestic consumption perhaps contributed to the price decline. Use in the major domestic consumption category, flame retardants, rose moderately. It is

believed that the flame retardant market is likely to remain strong from some years.

It is anticipated that the reliance of the United States on imported antimony materials will continue, with China's dominance as a supplier of antimony continuing.

## **SOURCES OF INFORMATION**

### **U.S. Geological Survey Publications**

- Antimony. Ch. in Minerals Commodity Summaries, annual.<sup>1</sup>
- Antimony. Ch. in Minerals Yearbook, annual.<sup>1</sup>
- Antimony. Ch. in United States mineral resources, U.S. Geological Survey Professional Paper 820.
- Antimony. Mineral Industry Surveys, quarterly.<sup>1</sup>

### **Other**

- American Metal Market, daily.
- Antimony. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines, Bulletin 675, 1985.
- Engineering and Mining Journal.
- Metal Bulletin (London).
- Platt's Metals Week.

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<sup>1</sup>Prior to January 1996, published by the U.S. Bureau of Mines.

TABLE 1  
SALIENT ANTIMONY STATISTICS 1/

(Metric tons of antimony content unless otherwise specified)

	1992	1993	1994	1995	1996
United States:					
Production:					
Primary:					
Mine (recoverable antimony) 2/	360	266	215	262	242
Smelter	20,100	22,000	25,500	23,500	25,700
Secondary 3/	12,700 r/	9,620 r/	12,200 r/	10,500	7,900
Exports of metal, alloys, waste and scrap	947	315	1,350	1,610	462
Exports of antimony oxide 4/	4,820	3,900	6,500	6,590	3,990
Imports for consumption	31,200	30,900	41,500	36,600	37,600
Reported industrial consumption, primary antimony	12,200	12,400	14,800	14,300	13,600
Stocks: Primary antimony, all classes, Dec. 31	8,740	9,080	10,900	10,600	11,200
Price: Average, cents per pound 5/	79.0	76.9	177.7	227.8	146.5
World: Mine production	90,100 r/	87,800	117,000 r/	154,000 r/	126,000 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits, except prices.

2/ Data from 10-K reports.

3/ A review of secondary lead smelting, the source of nearly all secondary antimony, showed that recovery of secondary antimony had been markedly overstated in the 1994 and earlier annual reviews.

4/ Antimony content is calculated by the U.S. Geological Survey.

5/ New York dealer price for 99.5% to 99.6% metal, c.i.f. U.S. ports.

TABLE 2  
REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY ANTIMONY  
IN THE UNITED STATES 1/

(Metric tons of antimony content)

Year	Class of material consumed			Total
	Metal	Oxide	Other 2/	
1995	2,850	11,400	106	14,300
1996	2,060	11,400	131	13,600

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes sulfide and residues.

TABLE 3  
REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY  
ANTIMONY IN THE UNITED STATES, BY PRODUCT 1/

(Metric tons of antimony content)

Product	1995	1996
<b>Metal products:</b>		
Antimonial lead	2,230	1,760
Bearing metal and bearings	53	44
Solder	192	255
Other 2/	1,290	1,050
Total	3,760	3,110
<b>Nonmetal products:</b>		
Ammunition primers	19	17
Ceramics and glass	1,080	1,030
Pigments	492	450
Plastics	1,090	1,080
Other 3/	85	115
Total	2,770	2,690
<b>Flame-retardants:</b>		
Adhesives	263	248
Plastics	6,690 r/	6,830
Rubber	443	403
Textiles	379	275
Other 4/	23 r/	5
Total	7,800 r/	7,770
<b>Grand total</b>	<b>14,300</b>	<b>13,600</b>

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes ammunition, cable covering, castings, sheet and pipe, and type metal.

3/ Includes fireworks and rubber products.

4/ Includes paper and pigments.

TABLE 4  
INDUSTRY STOCKS OF PRIMARY ANTIMONY  
IN THE UNITED STATES, DECEMBER 31 1/

(Metric tons of antimony content)

Type of material	1995	1996
Metal	2,450	3,480
Oxide	4,450	4,330
Other 2/	3,680	3,360
Total	10,600	11,200

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes ore and concentrate, sulfide and residues.

TABLE 5  
U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND  
WASTE AND SCRAP, BY COUNTRY 1/

Country	1995		1996	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Canada	178	\$482	147	\$392
Mexico	672	994	240	945
Netherlands	162	569	--	--
Spain	209	994	--	--
Taiwan	138	1,090	1	7
United Kingdom	112	164	(2/)	(2/)
Other	140	718	73	420
Total	1,610	5,010	462	1,760

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 6  
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY 1/

Country	1995			1996		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
Australia	54	45	\$216	60	50	\$211
Brazil	572	475	578	162	134	647
Canada	1,890	1,570	6,140	1,420	1,180	5,400
Colombia	436	362	730	120	100	584
Germany	12	10	63	98	81	430
Indonesia	192	159	303	10	8	55
Italy	254	211	633	171	142	649
Japan	1,050	873	2,600	852	707	2,300
Korea, Republic of	153	127	502	172	143	755
Mexico	875	726	1,860	274	227	1,590
Netherlands	18	15	60	26	22	69
Singapore	735	610	1,980	589	489	2,040
Taiwan	885	735	1,320	411	341	1,580
Turkey	95	79	265	50	42	337
United Kingdom	358	297	1,740	154	128	703
Other	361	299	965	239	198	1,210
Total	7,940	6,590	19,900	4,810	3,990	18,600

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Antimony content is calculated by the U.S. Geological Survey.

Source: Bureau of the Census.

TABLE 7  
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY 1/

Country	1995			1996		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
<b>Antimony ore and concentrate:</b>						
Australia	245	201	\$403	8	5	\$49
Bolivia	2,500	2,050	11,000	270	221	336
Canada	1,550	481	1,140	542	144	415
China	1,260	1,060	3,920	511	473	1,190
Kyrgyzstan	278	228	1,210	--	--	--
Other	306 r/	231 r/	636 r/	282	159	890
<b>Total</b>	<b>6,140</b>	<b>4,260</b>	<b>18,300</b>	<b>1,610</b>	<b>1,000</b>	<b>2,880</b>
<b>Antimony oxide:</b>						
Belgium	1,120	926	6,270	1,300	1,080	5,620
Bolivia	2,080	1,720	5,650	2,990	2,480	8,710
China	6,780	5,630	26,900	9,310	7,730	27,400
France	240	199	1,520	259	215	1,020
Germany	183	152	3,120	--	--	--
Guatemala	--	--	--	220	183	729
Hong Kong	170	141	834	253	210	887
Kyrgyzstan	753	625	2,630	180	150	424
Mexico	3,720	3,080	1,700	3,800	3,150	6,850
South Africa	3,180	2,640	886	3,440	2,860	870
United Kingdom	133	110	947	181	150	718
Other	225	188	1,390	172	143	997
<b>Total</b>	<b>18,600</b>	<b>15,400</b>	<b>51,800</b>	<b>22,100</b>	<b>18,300</b>	<b>54,200</b>

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Antimony ore and concentrate content reported by Bureau of the Census. Antimony oxide content is calculated by the U.S. Geological Survey.

Source: Bureau of the Census.

TABLE 8  
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY 1/

Country	1995		1996	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Bolivia	255	\$1,010	153	\$424
Canada	120	371	128	338
Chile	20	78	5	36
China	12,100	50,600	13,500	38,000
Hong Kong	841	2,250	1,620	4,710
Kyrgyzstan	1,880	4,050	1,240	4,040
Japan	23	942	24	1,090
Mexico	1,630	1,180	1,330	1,030
Thailand	20	64	119	387
United Kingdom	20	251	58	304
Other	1	168	88	530
<b>Total</b>	<b>16,900</b>	<b>60,900</b>	<b>18,300</b>	<b>50,900</b>

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 9  
ANTIMONY: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1992	1993	1994	1995	1996 e/
Australia 3/	1,701	1,700 e/	1,700 e/	900 r/	1,300 4/
Bolivia	6,022	5,556	7,050	6,426 r/	6,600
Canada 5/	948	673	750	574 r/	1,405 p/
China e/	59,000 r/	60,000	91,000 r/	125,000 r/	98,000
Czech Republic e/ 6/	XX	250	--	--	--
Czechoslovakia e/ 7/	1,000	XX	XX	XX	XX
Guatemala e/	582 4/	600	600	610	610
Honduras	--	--	--	4,800	4,800
Kyrgyzstan e/	3,000	2,500	2,000 r/	1,500 r/	1,200
Mexico 8/	1,200 e/	1,469	267 r/	-- r/	-- 4/
Morocco 5/	197	180	175	-- r/	--
Namibia (content of sodium antimonate)	6	8	29	-- e/	--
Pakistan e/	12	--	--	6 4/	5
Peru (recoverable)	339	240	460 e/	460 e/	460
Russia (recoverable) e/	10,000	8,000	6,000 r/	6,000 r/	6,000
Slovakia e/ 6/	XX	450	400	400	300
South Africa 5/	3,779	4,111	4,534	5,537 r/	4,800
Tajikistan e/	1,500	1,200	1,000	1,000	500
Thailand (content of ore and concentrate) e/	270	620	500	230 r/	250
Turkey	309	111	75	100 e/	100
United States	W	W	W	W	W
Zimbabwe 5/	254	95	65	37 r/	50
Total	90,100 r/	87,800	117,000 r/	154,000 r/	126,000

e/ Estimated. p/ Preliminary. r/ Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.

1/ World totals and estimated data have been rounded to three significant digits; may not add to totals shown.

2/ Antimony content of ore unless otherwise indicated. Table includes data available through June 10, 1997.

3/ Antimony content of antimony ore and concentrate, lead concentrates, and lead-zinc concentrates.

4/ Reported figure.

5/ Antimony content of concentrate.

6/ Formerly part of Czechoslovakia; data were not reported separately until 1993.

7/ Dissolved Dec. 31, 1992.

8/ Antimony content of ores for export plus antimony content of antimonial lead and other smelter products produced.